"OPPORTUNISTIC MONITORING OF SHIPS' STRUCTURE FROM DIFFUSE VIBRATIONS: PERFORMANCE STUDY FOR DAMAGE DETECTION "

Award No.: N000141010823
Final Report

Principal Investigator:
Dr. Karim G. Sabra
Georgia Institute of Technology,School of Mechanical Engineering
771 Ferst Drive, NW,Atlanta, GA 30332-0405
(404) 385-6193 (Tel)- (404)-894-8496 (Fax)

1. Objectives and Progress

Long term objective**:** To develop a real-time and passive structural health monitoring methodology for high-speed Navy vessels from coherent processing of random vibrations recorded on a distributed sensor network during at-sea operation.

The objective of this research award was to quantify experimentally the sensitivity of the Diffuse Vibration Interferometry (DVI) technique for passive structural health monitoring of aluminum parts undergoing fatigue testing during the upcoming three phase tasks at NSWCCD. PI Sabra addressed-with Dr. Liming Salvino-the following issues 1) optimal layout of the sensor location to cover expected failure areas on the fatigue specimen, 2) Acquisition of vibration data using a NI system lent by PI Sabra. Analysis of preliminary accelerometers data collected on specimen by Dr. Ben Grisso were conducted by PI Sabra. Additionally, small-scale experimental studies were conducted in the lab of PI Sabra (see [Reference #1]).

2. Properties Acquired: None.

3. Travels: PI Sabra visited Carderock in October 2010 to evaluate the manufactured speciment for the fatigue tests.

4. Reports, Articles and Presentations:

1. A. Duroux*, K.G. Sabra, J. Ayers, M. Ruzzene, "Using cross-correlations of elastic diffuse fields for attenuation tomography of structural damage," *J. Acoustical Society of America,* 127, pp. 3311-3314 (2010).
2. K.G. Sabra and S. Huston*, "Passive structural health monitoring of a high-speed naval ship from ambient vibrations", *J. Acoustical Society of America*, 129, pp. 2991-2999 (2011)

5. Finances

The budget has been spent accordingly to initial budget estimate.